TEXAS A&M TECHNOLOGY COMMERCIALIZATION

Living Bioreactor for Stoichiometric Protein Production

Inventors

Hongmin Qin, Ph.D.
Texas A&M University
Dept. of Biology

Research Interests

- Ciliogenesis and ciliopathies
- Algae synthetic biotechnology

Wallace Marshall, Ph.D.
UC San Francisco
Dept. of Biochemistry & Biophysics

Research Interests

- Pattern Formation and Regeneration in a Single Cell
- Cellular spatial awareness and organization

Contact

Girard Courteau Jr., JD
Licensing Associate
Texas A&M University
Technology Commercialization
(979)-862-1933
GCourteau@tamu.edu
Docket: 4709

TECHNOLOGY COMMERCIALIZATION

Overview

Living bioreactors are powerful systems for producing a variety of valuable compounds. The versatility of such bioreactors is one of the more useful aspects of the system. Large quantities of compounds or cellular components can be produced efficiently, with minimal cost. Alternately, these systems can be used to produce pathway components that are necessary in the production of secondary products. A common problem with such systems is that they are limited by non-uniform production of pathway components, or require an isolation process to ensure the components are in the appropriate quantity and sequence in the process. Inventors at Texas A&M and UC San Francisco have developed a novel technique to address these issues. The technology effectively results in a stoichiometric production of protein components that are produced in an array, ready for secondary production.

Technology

The living bioreactor produces a nanofabrication of polymers of the same or varied lengths which are produced as liposomes. The enzymes in the liposomes are produced in stoichiometric fashion, in a linear array which is precisely defined. The liposomes resist harsh conditions, and if necessary can be isolated easily. The system is especially practical for performing multi- enzymatic pathway processes that allow for efficient localization of intermediates to the next enzyme in the pathway. While the production of proteins as enzymes is a prominent aspect of the invention, the bioreactor would also be useful for preparing peptides, bioactive enzymes, protease-sensitive proteins, vaccines, antibodies and other compounds.

Advantages

- Nanofabrication of enzymes to prepare linear arrays for biosynthetic pathways
- Production of protease-sensitive proteins
- Production of two or more proteins in precise stoichiometry
- Renewable, low-cost production process

Applications

- Biosynthetic pathway production for a variety of compounds
- Applications in drug and vaccine development, protein production

Stage of Development

- Demonstrated production of linear protein polymer
- Renewable production of protein proof of concept completed

Inventor's Relevant Publications

Yanagisawa, H., Mathis, G., Oda, T., Hirono, M., Richey, E. A., Ishikawa, H., … Qin, H. (2014). **FAP20 is an inner junction protein of doublet microtubules essential for both the planar asymmetrical waveform and stability of flagella in Chlamydomonas.** Molecular Biology of the Cell, 25(9), 1472–1483. http://doi.org/10.1091/mbc.E13-08-0464

Ishikawa H, Ide T, Yagi T, Jiang X, Yanagisawa H, Sasaki H, Stainier D, Qin H, Kamiya R, Marshall W, "**TTC26/DYF13 undergoes intraflagellar transport and is required for cilia/flagella formation and transport of inner dynein components into flagella**," Elife. 2014 Jan 1;3:e01566. doi: 10.7554/eLife.01566.